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(54) **PROFILE STRIP ARRANGEMENT**

(71) Applicant: **Elkamet Kunststofftechnik GmbH**,
Biedenkopf (DE)

(72) Inventors: **Andreas Schoch**, Gladenbach (DE);
Michael Ortmueller,
Dautphetal-Herzhausen (DE); **Martin**
Deussen, Marburg (DE)

(73) Assignee: **ELKAMET**
KUNSTSTOFFTECHNIK GMBH,
Biedenkopf (DE)

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Primary Examiner — Maria V Ewald

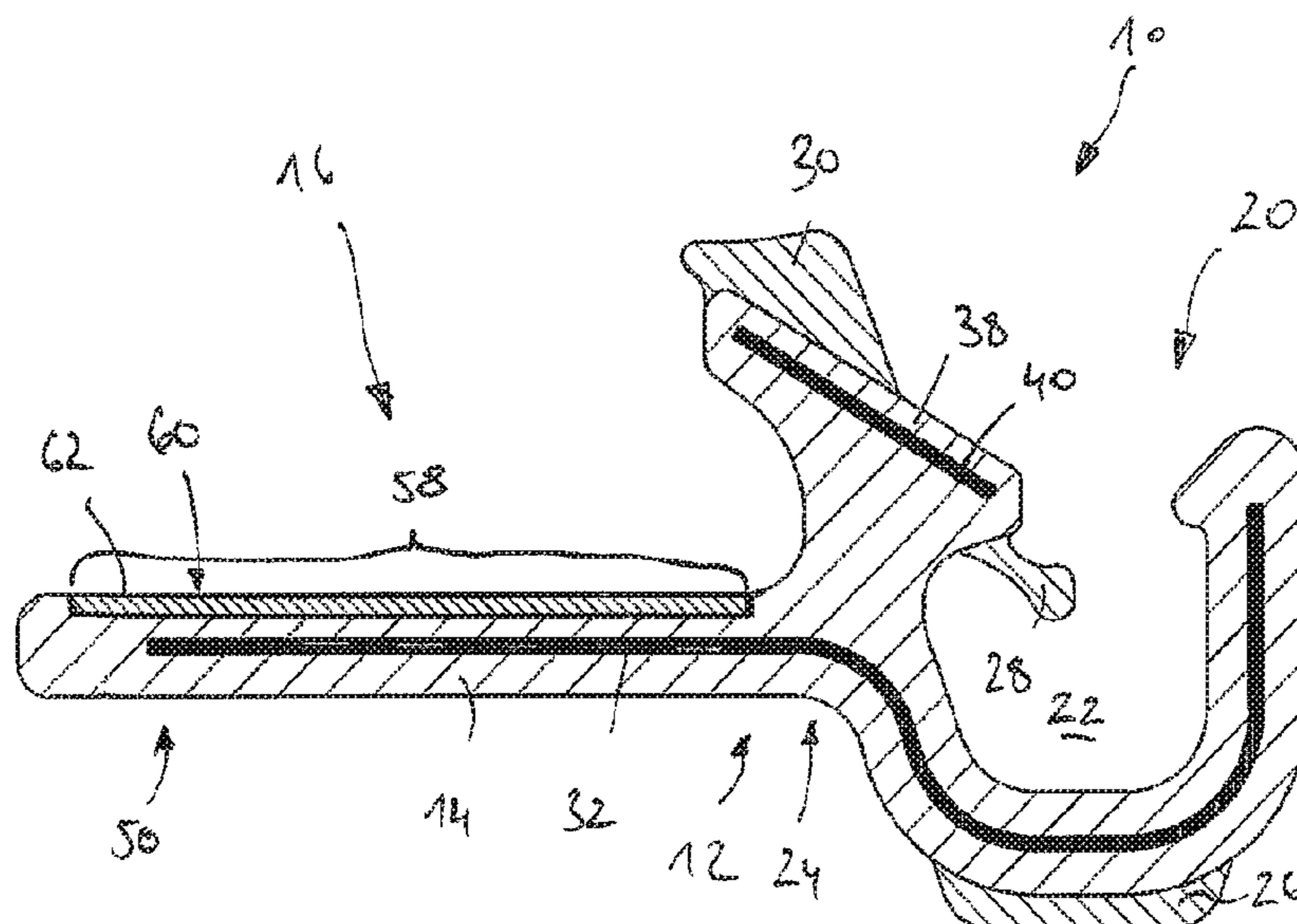
Assistant Examiner — Zachary M Davis

(74) *Attorney, Agent, or Firm* — Leyig, Voit & Mayer,
Ltd.

(57) **ABSTRACT**

A profile strip arrangement includes a profile strip made of a profile material. The profile strip has a first connecting area configured to form a connection to an edge area of a windshield of a motor vehicle, and has a second connecting area configured to form a connection to a part that is adjacent to the windshield. The first connecting area has a lower connecting section which interacts with an inside of the edge area of the windshield and which has at least one free surface section that is free of the profile material. The at least one free surface section is formed by a surface of an additional element that is made of a material that differs from that of the profile strip.

12 Claims, 5 Drawing Sheets



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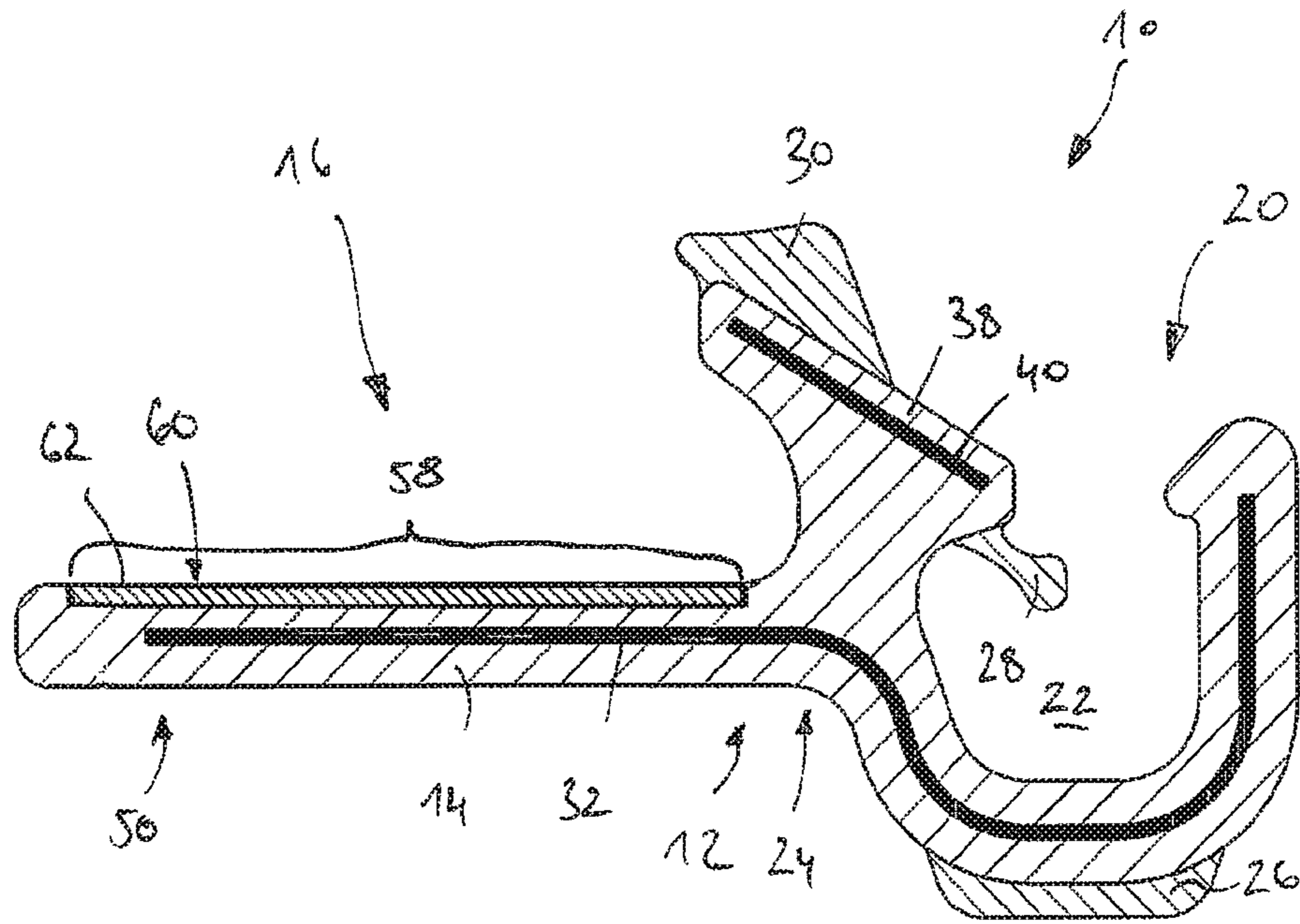


Fig. 1

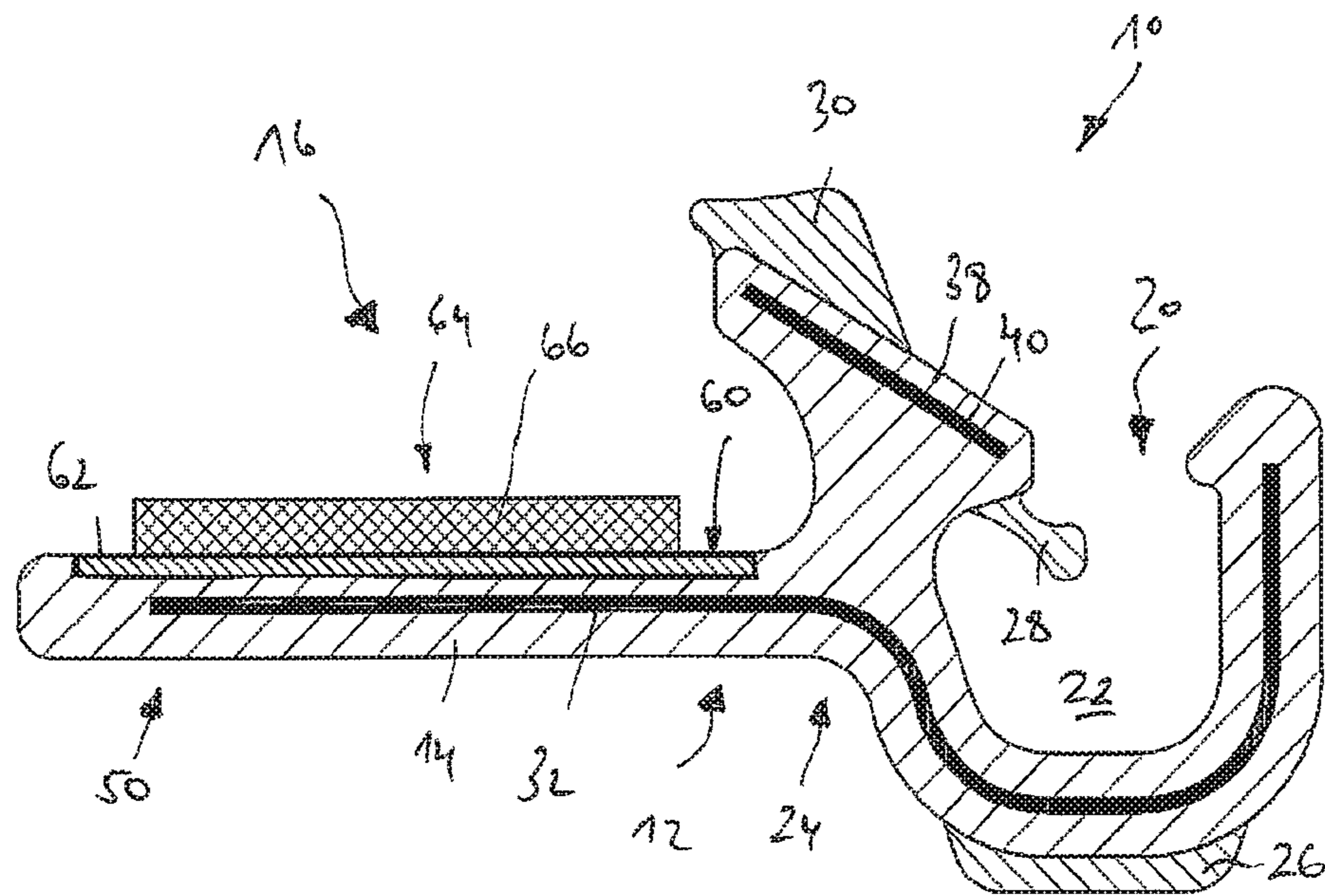


Fig. 2

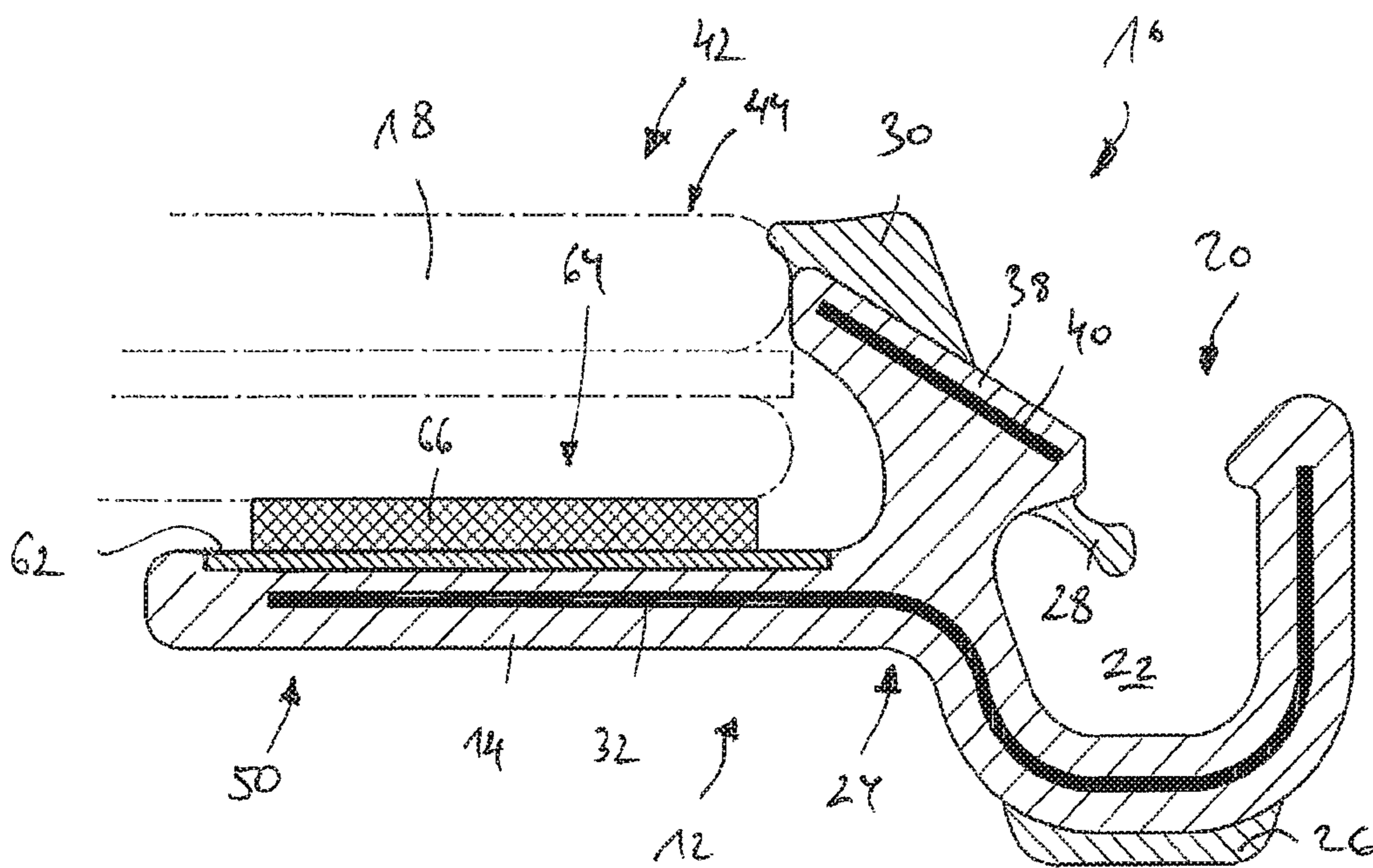


Fig. 3

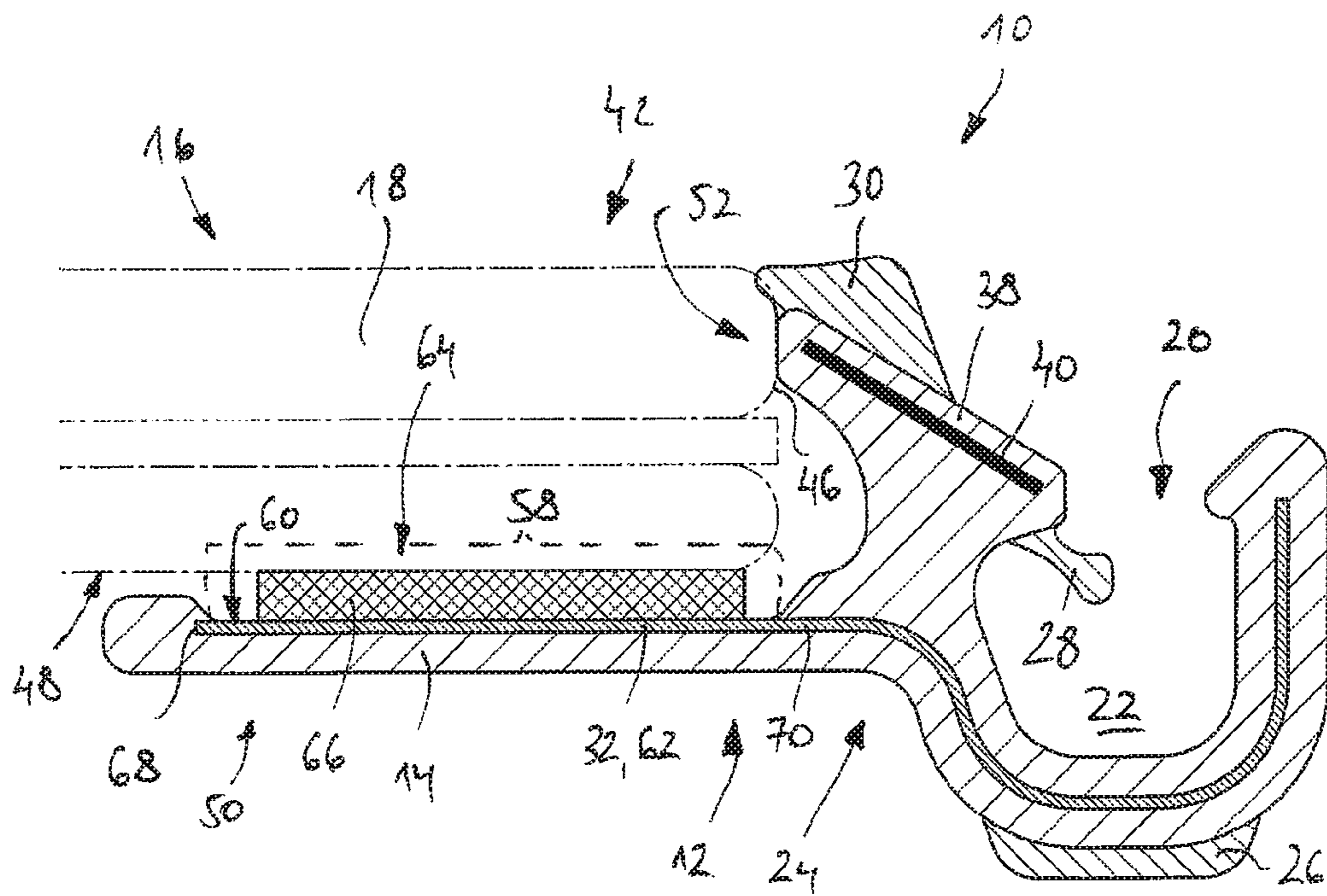


Fig. 4

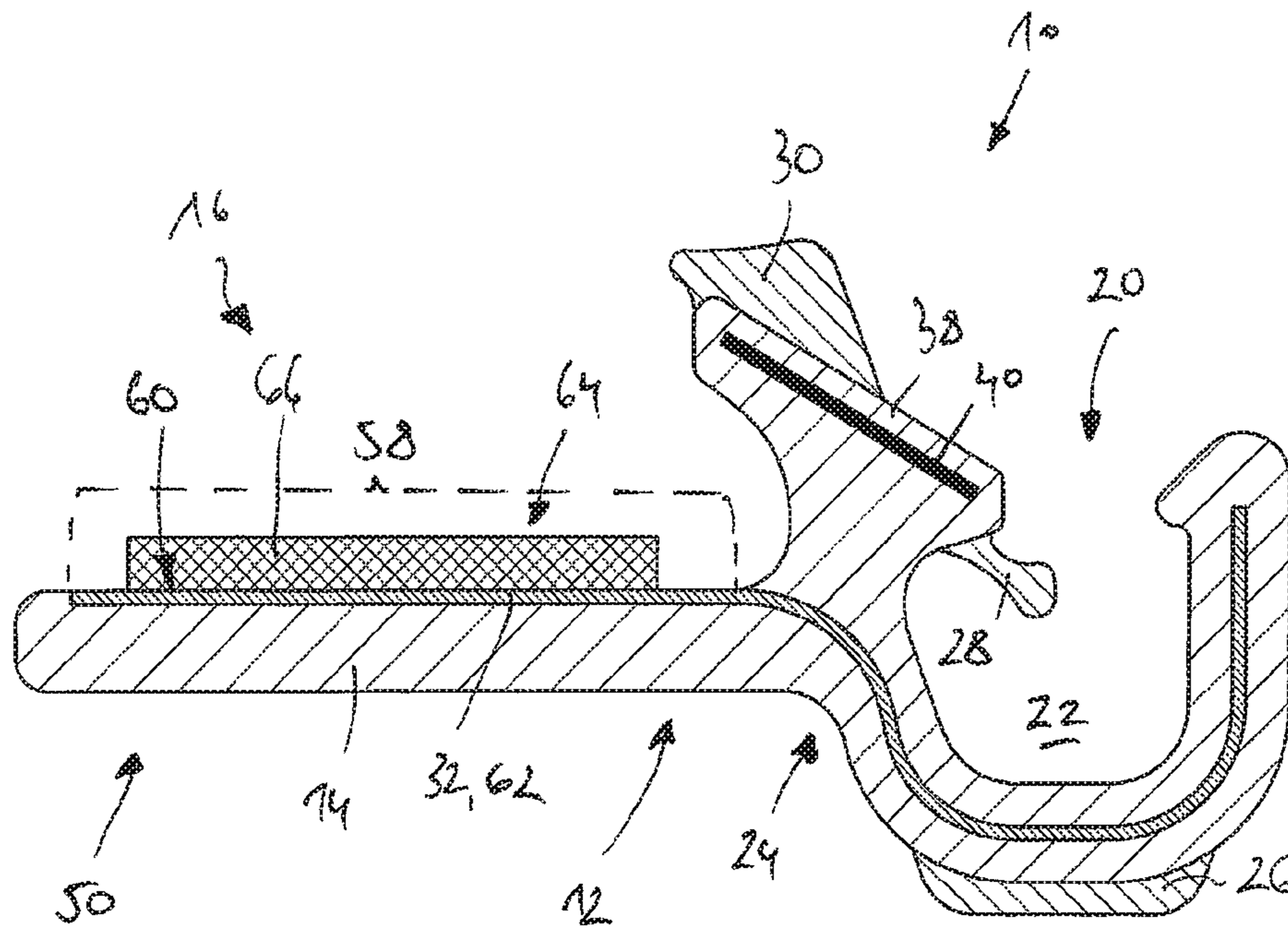


Fig. 5

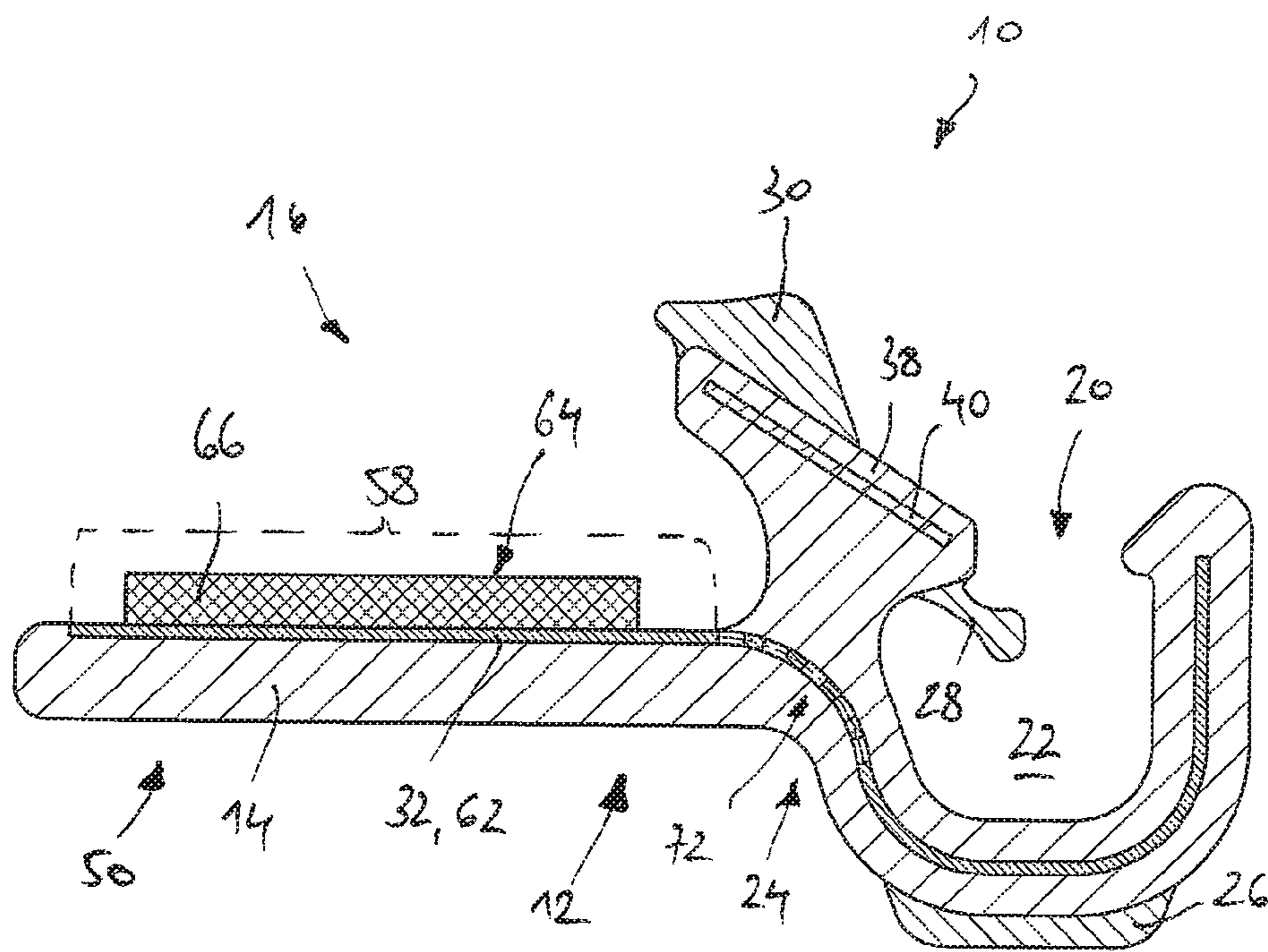


Fig. 6

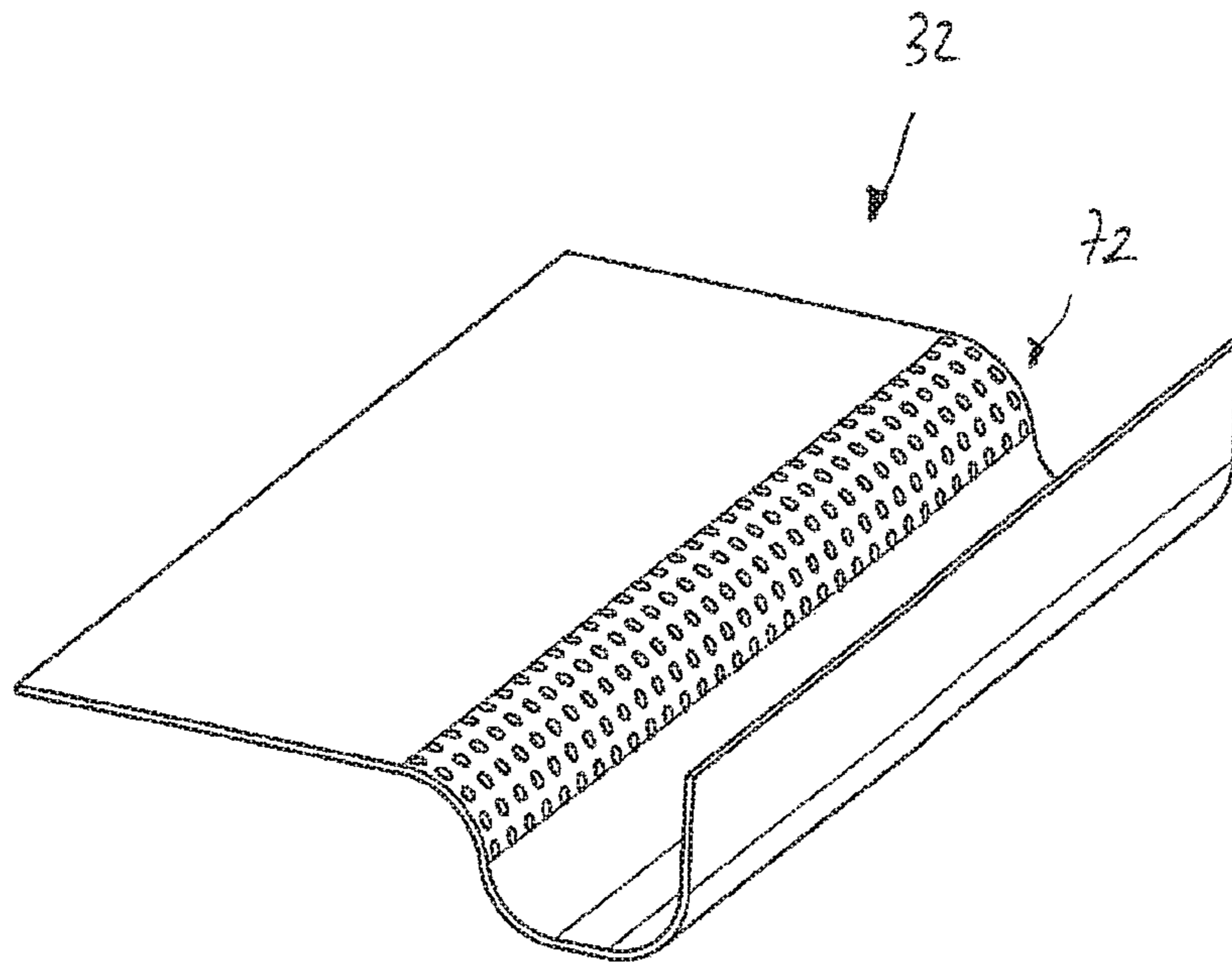


Fig. 7

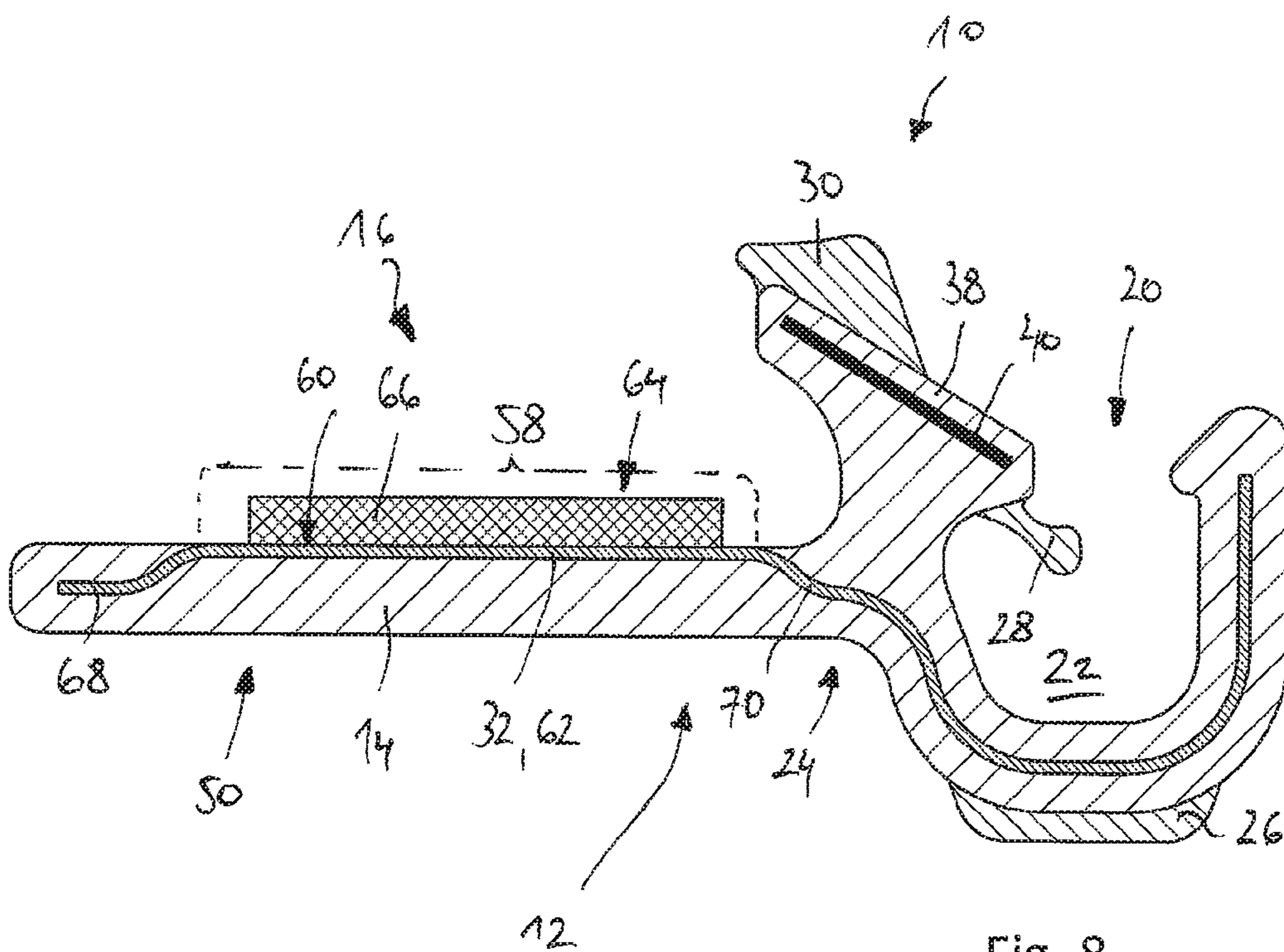


Fig. 8

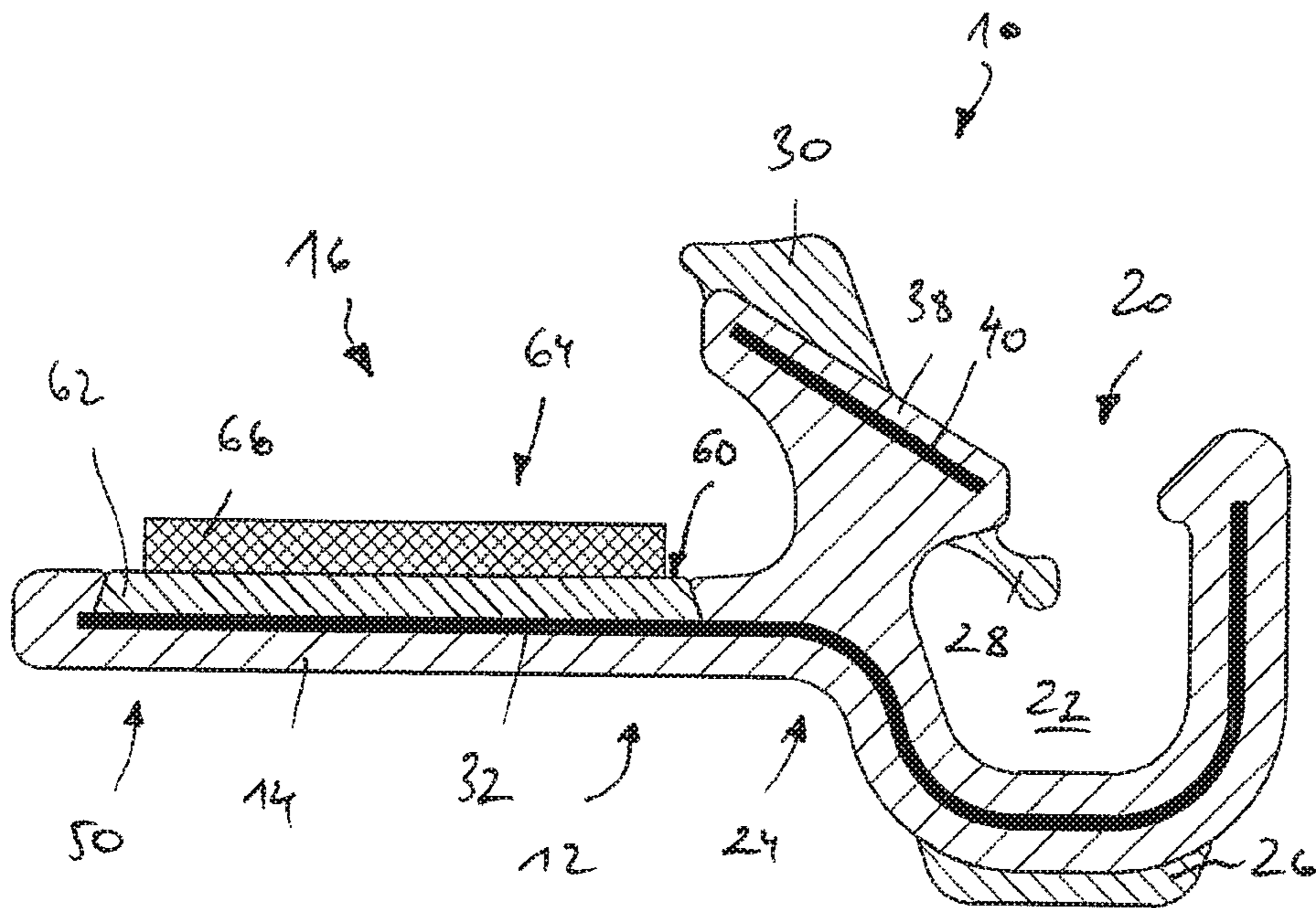


Fig. 9

1**PROFILE STRIP ARRANGEMENT**

CROSS-REFERENCE TO PRIOR APPLICATION

Priority is claimed to German Patent Application No. DE 10 2016 104 848.8, filed on Mar. 16, 2016, the entire disclosure of which is hereby incorporated by reference herein.

FIELD

The invention relates to a profile strip arrangement, comprising a profile strip made of a profile material, having a first connecting area for purposes of creating connection to an edge area of the windshield of a motor vehicle, and having a second connecting area for purposes of creating a connection to a part that is adjacent to the windshield.

BACKGROUND

Profile strip arrangements of the above-mentioned type are disclosed, for example, in German utility model DE 20 2008 013 133 U1. This publication proposes the use of a connecting strip to attach the profile strip to the rear surface of the windshield, thereby creating a simple, fast and cost-effective connection. An example of a connecting strip is a double-sided adhesive tape of the kind disclosed in German patent application DE 10 2012 112 663 A1.

Another refinement is known from German patent application DE 10 2008 003 252 A1. This document proposes using not only a double-sided adhesive tape, but also an adhesive section that has been applied while in the free-flowing state in order to create the stiffest possible connection between a profile strip and a windshield.

Another refinement is disclosed in German patent application DE 10 2012 112 674 A1. This publication proposes that a double-sided adhesive tape be integrally bonded to an additional adhesive bead in the area of a front edge in order to prevent the adhesive tape from peeling off.

SUMMARY

In an embodiment, the present invention provides a profile strip arrangement including a profile strip made of a profile material. The profile strip has a first connecting area configured to form a connection to an edge area of a windshield of a motor vehicle, and has a second connecting area configured to form a connection to a part that is adjacent to the windshield. The first connecting area has a lower connecting section which interacts with an inside of the edge area of the windshield and which has at least one free surface section that is free of the profile material. The at least one free surface section is formed by a surface of an additional element that is made of a material that differs from that of the profile strip.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be described in even greater detail below based on the exemplary figures. The invention is not limited to the exemplary embodiments. Other features and advantages of various embodiments of the present invention will become apparent by reading the following detailed description with reference to the attached drawings which illustrate the following:

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FIG. 1 a side view of a first embodiment of a profile strip arrangement, comprising a profile strip with an additional element;

FIG. 2 the profile strip arrangement according to FIG. 1, additionally comprising an adhesive section;

FIG. 3 the profile strip arrangement according to FIG. 2, additionally comprising a windshield;

FIG. 4 a side view of another embodiment of a profile strip arrangement, comprising at least an additional element in the form of a reinforcement insert;

FIG. 5 a side view of another embodiment of a profile strip arrangement;

FIG. 6 a side view of another embodiment of a profile strip arrangement;

FIG. 7 a perspective view of a reinforcement insert of the profile strip arrangement according to FIG. 6;

FIG. 8 a side view of another embodiment of a profile strip arrangement; and

FIG. 9 a side view of another embodiment of a profile strip arrangement, with an extruded profile strip, a co-extruded additional element and an adhesive section.

DETAILED DESCRIPTION

The above-mentioned constructions are too expensive in actual practice. Before this backdrop, an embodiment of the present invention provides an improved profile strip arrangement of the above-mentioned type in such a way that it can be produced cost-effectively.

According to an embodiment of the invention, the first connecting area has a lower connecting section which interacts with the inside of the edge area of the windshield and which has at least one surface section that is free of the profile material, whereby the free surface section is formed by the surface of an additional element that is made of a material that differs from that of the profile strip.

According to an embodiment of the invention, a surface section is provided that is free of profile material in the first connecting area. The profile material can be a plastic material, for instance, polyvinyl chloride (PVC), blends of polyvinyl chloride and poly(acrylonitrile-co-butadiene-co-styrene) (PVC/ABS) or polypropylene (PP). Particularly, polypropylene has proven to be sturdy and resistant in profile strip arrangements. The profile material, however, does not have any optimal properties when it comes to creating an integral bond to the windshield or to connecting layers situated in between.

According to an embodiment of the invention, a surface section that is free of the material of the profile strip is provided in a lower connecting section that interacts with the inside of the edge area of the windshield, whereby a surface that is arranged in this free surface section is made of a material that differs from the profile material. This makes it possible to create a relatively large-surface, sturdy and cost-effective connection between the profile strip and the inside of the edge area of the windshield.

The additional element is especially a flat body that is arranged at least in or on the lower connecting section of the first connecting area.

Preferably, the additional element is made of a plastic material, whereby the plastic material preferably has a higher surface energy than the profile material. When it comes to the additional element, preference is given to the following plastic materials: polymethyl methacrylate (PMMA), polycarbonate (PC), acrylonitrile butadiene styrene (ABS), polyvinyl chloride (PVC), polyethylene terephthalate (PET), polyamides (e.g. PA6, PA6.6, PA11,

PA12). These materials display a better adhesive bondability than the material of the profile.

The surface energies of the profile material and of the material of the additional element can be ascertained in a familiar manner by means of contact angle measurements followed by an evaluation based on Young's equation, as described in the DIN EN 828:2013 standard. In this context, it is sufficient to determine the surface energies of the profile material and of the material of the additional element under identical measuring conditions (particularly using the same test liquids each time) and to subsequently compare them to each other.

The additional element can be configured as a nonwoven, a fabric, a ribbon or a tape. The additional element can be made of a composite material comprising fibers and a plastic matrix. The following are especially well-suited as the fiber material: mineral fibers, glass fibers or carbon fibers. The fibers can be short, long or continuous fibers; suitable plastics for the plastic matrix are, for example, those mentioned above for the profile material as well as particularly the plastics mentioned above for the plastic material of the additional element.

The additional element can also be made of metal. Preferred metals are steel, steel alloys, aluminum and aluminum alloys. These materials exhibit better adhesive properties than the material of the profile.

It is possible for the surface of the additional element to be the surface that is arranged in the area of the surface section that is free of the profile material. However, it is likewise possible for the additional element to have a coating; in this case, the surface section that is free of the profile material is formed by a surface that is made of the coating material and that is supported by the additional element. The coating can be, for instance, a protective layer or a coupling layer, especially for those cases where the additional element is made of metal.

It is possible for the first connecting area to have not only a lower connecting section but also a lateral connecting section that interacts with a face of the edge area of the windshield, and/or for the first connecting area to have an upper connecting section that interacts with the outside of the edge area of the windshield, and for the at least one free surface section to be arranged on the lower connecting section and/or on the lateral connecting section and/or on the upper connecting section.

An upper connecting section of a first connecting area is provided especially in the case of profile strips that have a so-called U-shaped connection of the profile strip to the edge area of the windshield. In this U-shaped connection, there is a lower connecting section as well as a lateral connecting section and also an upper connecting section, whereby the lower connecting section and the upper connecting section form the legs of a "U" and wrap around the edge area of the windshield.

A particularly simple and compact connection option between the profile strip and the windshield is created when the free surface section faces the edge area of the windshield.

The profile strip arrangement according to the invention is especially suitable for profile strips that have a receiving space with a U-shaped or V-shaped profile in the second connecting area for purposes of receiving a latching element of the part that is adjacent to the windshield, particularly an air inlet panel. Such second connecting areas are disclosed, for example, in European patent application EP 2 123 497 A1.

It is possible for the additional element to be arranged only in the first connecting area, where it extends exclusively in the free surface section. In this manner, an additional element, which is relatively small and easy to produce, is sufficient in order to create better preconditions for an integral bond between the profile material and the windshield.

However, it can also be preferable for the bottom as well as the top of the additional element to be covered with profile material in the area of a partial section. Such an additional element therefore has at least one partial area in which the additional element is anchored in the material of the profile strip.

The above-mentioned partial section can especially be a free end of the additional element and/or a section of the additional element facing the second connecting area. As a result, the additional element is optimally protected against peeling off from the profile material.

In another preferred embodiment of the invention, it is provided that the profile strip has a central section which connects the first connecting area and the second connecting area to each other, and that the additional element has openings in the area of the central section, especially in the form of perforations. This allows a further optimized anchoring of the additional element in the material of the profile strip.

In a particularly preferred embodiment, it is provided for the additional element to be formed by a reinforcement insert that stiffens the profile strip. Such a reinforcement insert can especially comprise foils or sheets made of metal, particularly steel or a steel alloy, or else aluminum or an aluminum alloy.

As an alternative to this, the reinforcement insert can also be made of a non-metallic material, for example, of a plastic material that differs from the profile material, or else of a composite material comprising fibers and a plastic matrix.

The use of the reinforcement insert as an additional element by exposing the surface of a reinforcement insert in the first connecting area accounts for a particularly simple and cost-effective production of a profile strip arrangement.

In order to create an integral bond between the first connecting area and the windshield, it is proposed that at least a partial area of the free surface section is covered by an adhesive section that serves for purposes of creating an adhesive connection to the edge area of the windshield. It is possible for the adhesive section to be a free-flowing adhesive material that is applied onto the surface of the additional element in order to then be connected to the edge area of the windshield.

It is especially preferable for the adhesive section to be in the form of a double-sided adhesive tape. Owing to the inventive exposure of a surface section in which there is no profile material, adhesive tapes can be employed in this area whose adhesive properties only need to be optimized in terms of the surface of the additional element and in terms of the edge area of the windshield, but not in terms of the adhesiveness vis-à-vis the material of the profile strip. This allows the use of simple and inexpensive adhesive tapes.

According to another embodiment, the present invention provides a method with which a profile strip arrangement of the type described above can be produced cost-effectively.

According to an embodiment of the method, the profile strip and the additional element are produced independently of each other and subsequently joined together, especially glued and/or pressed together.

According to an embodiment of the method, the material of the profile strip is extruded, the additional element is

added during the extrusion of the profile material, and the profile material solidifies when it is connected, at least in certain sections, to the additional element.

Embodiments and advantages of the method according to the invention have already been partially elaborated upon above. For this reason, reference is hereby made to the description above, along with the following additions:

The production of the profile strip and of the additional element independently of each other followed by the joining of these parts is particularly well-suited for profile strip arrangements in which the additional element extends exclusively in the free surface section.

If the additional element is added during the extrusion of the profile material, then the additional element can be a continuous profiled extrudate or a tape of metallic material or plastic material or fiber-plastic composite material, whereby the continuous extrudate or the tape passes through the extrusion die together with the profile material, so that the additional element as well as the profile strip can be produced together with each other in a continuous process.

For those cases in which it is not the ready-made additional element, but rather only the material for the production of the additional element that is added during the extrusion of the profile material (“co-extrusion”), it is preferable for the additional element to be made of a plastic material that differs from the material of the profile strip. In this context, especially the materials mentioned above for the additional element can be employed.

The profile strip arrangements shown in FIGS. 1 to 6 as well as 8 and 9 are designated in their entirety by the reference numeral 10. The profile strip arrangements 10 each comprise a profile strip 12 that is made of a profile material 14. The profile material 14 is a plastic, for example, a polyvinyl chloride (PVC), blends of polyvinyl chloride and poly(acrylonitrile-co-butadiene-co-styrene) (PVC/ABS) or especially polypropylene (PP).

The profile strips 12 each have a first connecting area 16 for purposes of creating a connection to a windshield 18 (see FIGS. 3 and 4), as well as a second connecting area 20 to connect the profile strip 12 to a part that is adjacent to the windshield 18, especially a air inlet panel. Such parts are disclosed, for example, in European patent application 2 123 497 A1 and they have latching elements that latch into a U-shaped or V-shaped receiving space 22 of the second connecting area 20 so that the part that is adjacent to the windshield can be attached to the profile strip 12.

The profile strips 12 each have a central section 24 in order to connect the first connecting area 16 and the second connecting area 20.

It is possible for the profile strips 12 to have additional functional sections that are made of a material that differs from the profile material 14. Such functional sections can be, for instance, a support section 26 that supports the second connecting area 20 on a vehicle part. It can also be, for example, a latching element 28 that is associated with the second connecting area 20. It can also be a sealing element 30 that serves to create a tightly sealed contact against a windshield and against the part that is adjacent to the windshield.

It is possible and preferred for the profile strips 12 to be reinforced with a reinforcement insert 32 along their extension between the first connecting area 16 and the second connecting area 20.

The reinforcement insert 32 is especially a profiled flat body made of steel, a steel alloy, aluminum or an aluminum alloy. As an alternative to this, the reinforcement insert 32 can be made of plastic or fiber-plastic composite material

and can especially comprise a plastic that has a higher surface energy than the profile material.

It is also possible for a reinforcement insert 32 to extend only and exclusively inside one of the connecting area 16 or 20.

Moreover, in the case of an arrangement of a sealing element 30, it is preferable for a support section 38 of the profile strip 12 that supports the sealing element 30 to be likewise reinforced with a reinforcement insert 40.

When the windshield 18 is installed in a motor vehicle, it has a lower edge area 42 that interacts with the first connecting area 16 of the profile strip 12. The edge area 42 has an outside 44, a face 46 and an inside 48; see FIGS. 3 and 4.

The first connecting area 16 of the profile strip 12 has at least a lower connecting section 50 that interacts with the inside 48 of the edge area 42 of the windshield 18. It is possible to additionally provide a lateral connecting section 52 that interacts with the face 46 of the edge area 42 of the windshield 18.

It is also possible to provide an upper connecting section that interacts with the outside 44 of the edge area 42 of the windshield 18 and that preferably extends parallel to and at a distance from the lower connecting section 50, whereby, in the first connecting area 16, a lower connecting section 50, a lateral connecting section 52 and an upper connecting section together form a “U-shaped profile” that clamps around the edge area 42 of a windshield 18.

In the first connecting area 16, the profile strips 12 have a surface section 58 that is free of profile material 14. The surface section 58 is formed by a surface 60 of an additional element 62 instead of the profile material 14.

In the state in which the edge area 42 of the windshield 18 is arranged in or on the first connecting area 16, the surface 60 faces the edge area 42. The surface 60 provided on the lower connecting section 50 faces the inside 48 of the edge area 42 of the windshield (see FIGS. 1 to 6 as well as 8 and 9). If a surface 60 is arranged on a lateral connecting section 52, this surface 60 faces the face 46 of the edge area 42 of the windshield 18. If a surface 60 is arranged on an upper connecting section, this surface 60 faces the outside 44 of the edge area 42 of the windshield 18.

The additional element 62 according to FIGS. 1 to 3 is an additional element that is provided separately from the reinforcement inserts 32, 40 of the profile strip arrangements 10 and arranged at a distance from the reinforcement inserts 32, 40. This additional element 62 extends exclusively in the free surface section 58.

The additional element 62 is especially a plane flat element. The flat element is made, for instance, of a metallic material, especially of steel, a steel alloy, aluminum or an aluminum alloy. As an alternative to this, the additional element 62 can be made of a plastic material or a fiber-plastic composite material that has a higher surface energy than the profile material 14. It can be the case that the additional element 62 itself or else a coating of the additional element 62 forms the surface 60.

For purposes of creating an integral bond between the additional element 62 and the edge area 42 of the windshield 18, an adhesive section 64 is provided that is especially in the form of a double-sided adhesive tape 66. The adhesive tape 66 has adhesive sides facing away from each other. A first adhesive side interacts with the surface 60 of the additional element 62 while a second adhesive side facing away from the first side interacts with the inside 48 of the edge area 42 of the windshield 18.

It is possible for the profile strips **12** not to have any reinforcement inserts **32**, **40**. If at least one reinforcement insert **32**, **40** is provided, it is possible for such a reinforcement insert **32** and/or **40** to form an additional element **62**. Such arrangements are depicted in FIGS. **4** to **6** and **8**.

For instance, a reinforcement insert **32** is provided which is embedded into the material **14** of the profile strip **12** (see FIG. **4**). In a surface section **58**, the surface **60** of the reinforcement insert **32** or of a coating of the reinforcement insert **32** is exposed, so that the surface of the reinforcement insert **32** or a coating of the reinforcement insert **32** can be provided with an adhesive section **64**, especially with a double-sided adhesive tape **66**.

Preferably, the top and the bottom of a free end **68** of the reinforcement insert **32** are covered by profile material **14** and therefore at least a partial area of the reinforcement insert **32** is anchored in the profile material **14** of the profile strip **12**. This applies in a corresponding manner to a section **70** of the reinforcement insert **32** facing the second connecting area **20**.

In the embodiment depicted in FIG. **4**, the thickness of the profile material **14** varies along the extension of the lower connecting section **50**, as seen in the cross sectional direction.

It is likewise possible for the material thickness of the connecting section **50** not to vary, whereby, at the same time, a reinforcement insert **32** is employed as an additional element; see FIGS. **5**, **6** and **8**.

In the embodiment shown in FIG. **5**, the reinforcement insert **32** that forms an additional element **62** extends along a straight plane and in this area, it is only covered with profile material **14** on one side. In order to improve the anchoring of the reinforcement insert **32** in the profile material **14**, it can be provided that the reinforcement insert **32** has perforations **72**, as a result of which the possibility is created for the profile material **14** to penetrate the reinforcement insert **32**; see FIGS. **6** and **7**. Preferably, the perforations **72** are associated with the central section **24** of the profile strip **12**.

Another preferred way for a reinforcement insert **32** that forms an additional element to be anchored in the material **14** of the profile strip **12** is for the bottom as well as the top of at least a free end **68** and/or a section **70** of the reinforcement insert **32** that faces the second connecting area **20** to be covered with profile material **14**; see FIG. **8**. In this case, an additional element **62** can be created in that the reinforcement insert **32** is not embedded into the profile material **14** along its entire extension from the free end **68** all the way to the section **70**, but rather, in that it is covered with profile material **14** only on the bottom in the area of a free surface section **58**. This can be done, for example, in that the reinforcement insert **32** has an elevation along its extension between the free end **68** and the section **70**, so that the top of the reinforcement insert **32**, which is opposite from the bottom, forms a surface **60** that is free of profile material **14**. In this manner, the reinforcement insert **32** forms an additional element **62** in this area which preferably serves for the placement of a double-sided adhesive tape **66** or on which a double-sided adhesive tape **66** is glued.

Particularly in the case of an additional element **62** that is provided independently of the reinforcement insert **32**, **40**, the additional element **62** can also be a material section made of plastic that is preferably co-extruded together with the material of the profile strip **12**, see FIG. **9**.

While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or

exemplary and not restrictive. It will be understood that changes and modifications may be made by those of ordinary skill within the scope of the following claims. In particular, the present invention covers further embodiments with any combination of features from different embodiments described above and below. Additionally, statements made herein characterizing the invention refer to an embodiment of the invention and not necessarily all embodiments.

The terms used in the claims should be construed to have the broadest reasonable interpretation consistent with the foregoing description. For example, the use of the article "a" or "the" in introducing an element should not be interpreted as being exclusive of a plurality of elements. Likewise, the recitation of "or" should be interpreted as being inclusive, such that the recitation of "A or B" is not exclusive of "A and B," unless it is clear from the context or the foregoing description that only one of A and B is intended. Further, the recitation of "at least one of A, B and C" should be interpreted as one or more of a group of elements consisting of A, B and C, and should not be interpreted as requiring at least one of each of the listed elements A, B and C, regardless of whether A, B and C are related as categories or otherwise. Moreover, the recitation of "A, B and/or C" or "at least one of A, B or C" should be interpreted as including any singular entity from the listed elements, e.g., A, any subset from the listed elements, e.g., A and B, or the entire list of elements A, B and C.

What is claimed is:

1. A profile strip arrangement, comprising:

a profile strip made of a profile material, the profile strip having a first connecting area configured to form a connection to an edge area of a windshield of a motor vehicle, and having a second connecting area configured to form a connection to a part that is adjacent to the windshield, the first connecting area having a lower connecting section which interacts with an inside of the edge area of the windshield and which has at least one free surface section that is free of the profile material, the at least one free surface section being formed by a surface of an additional element that is made of a material that differs from that of the profile strip, the additional element being made of a plastic material having a higher surface energy than the profile material or a fiber-plastic composite material having a higher surface energy than the profile material; and a double-sided adhesive tape disposed on the additional element.

2. The profile strip arrangement according to claim 1, wherein the additional element has a coating.

3. The profile strip arrangement according to claim 1, wherein the at least one free surface section faces the edge area of the windshield.

4. The profile strip arrangement according to claim 1, wherein the second connecting area has a receiving space with a U-shaped or V-shaped profile configured to receive a latching element of the part that is adjacent to the windshield.

5. The profile strip arrangement according to claim 1, wherein the additional element extends exclusively in the at least one free surface section.

6. The profile strip arrangement according to claim 1, wherein a bottom and a top of the additional element are covered with the profile material in an area of a partial section.

7. The profile strip arrangement according to claim 6, wherein the partial section is formed by a free end of the

additional element and/or by a section of the additional element facing the second connecting area.

8. The profile strip arrangement according to claim **1**, wherein the profile strip has a central section which connects the first connecting area and the second connecting area to each other, and wherein the additional element has openings in an area of the central section. 5

9. The profile strip arrangement according to claim **1**, wherein the additional element is formed by a reinforcement insert that stiffens the profile strip. 10

10. The profile strip arrangement according to claim **1**, further comprising at least one reinforcement insert which is provided separate from the additional element.

11. A method for the production of a profile strip arrangement according to claim **1**, wherein the profile strip and the additional element are produced independently of each other and subsequently joined together. 15

12. A method for the production of a profile strip arrangement according to claim **1**, wherein the profile material of the profile strip is extruded, wherein the additional element or a material for the production of the additional element is added during the extrusion of the profile material, and wherein the profile material solidifies when it is connected, at least in certain sections, to the additional element. 20

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